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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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WOO-SUP SHIN

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EXAMINER

ZERVIGON, RUDY

ART UNIT

PAPER NUMBER

1763

DATE MAILED: 12/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/039,438	Applicant(s) SHIN ET AL.	
	Examiner Rudy Zervigon	Art Unit 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 September 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1, 2, 7, 10, 11, 13, 14, 17-22, 25, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schutt (US 3,532,568 A) in view of Chung et al (U. S. Pat. No. 5,000,795), Kanda (U.S.Pat. 4,338,157), and Allies, Victoria R. et al (U.S.Pat. 5,560,838). Schutt discloses an etching process and apparatus for chemically etching ("etching zone 1"; Sole figure) material from a substrate (copper, abstract). An etched product (iron; column 2, lines 1-10) is etched in unit 1 (Applicant's "etch bath") thereby at least contacting the solid with the aqueous liquid (sulfuric acid, HCl; column 1, lines 65-68) and the resulting liquid (3) is passed through an ion exchanger (8) to remove the ions from the rinse liquid which is reused or discharged. The solids are removed from an etcher ("etch bath") via a stream (3) which passes into a rinse chamber (5) including outlet pipe (7). The rinse liquid stream (7) then goes through an ion exchanger means (8, second tank). A replenishing solution (9) from the ion exchange means is combined with the bulk storage tank (11, first tank) going to the etcher (1). The bulk storage tank (11, first tank) has a stream flowing to the etcher (1) for etching the product.

Schutt does not disclose an immersion of a substrate in an etched bath or a bubble plate used therein.

Chung et al disclose a bubble plate (17) located on the floor of a tank (10; Fig. 1). The bubble plate (17) transmits inert gas to create a bubbling condition within the tank (10) for sufficient

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agitation (col. 1, lines 60-68). Silicon substrates (14; column 3, lines 44-48) are immersed in an etch bath ("hot sulfuric acid"; 13; Fig. 2; col. 2, lines 25-38; column 3, lines 44-48).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to replace the spray etcher of Schutt with the etch bath and bubble plate of Chung et al.

The motivation for doing so would be to replace the etchant delivery means (ie, sparger etcher) with an alternate and equivalent etching means (ie a bath etcher).

Schutt and Chung et al do not teach a temperature sensor and control unit.

Kanda et al disclose a process control system (45, 47-57; Figure 10; column 9, line 12 – column 10, line 47) having a thermocouple for measuring the temperature of the etching solution (8, Figure 2; column 9, lines 22-23) used to etch a submerged substrate (2, Figure 3). Kanda specifically teaches a control unit (45, 47-57; Figure 10; column 9, line 12 – column 10, line 47) for receiving a signal indicating the temperature (T) of the etchant from a temperature sensor ("thermocouple") and transmitting an etching termination signal (P _ 0) to the etch bath when the temperature reaches a target temperature. Further, Kanda teaches the etched thickness (Q; column 10, lines 10-15) of the substrate is derived from the temperature (T) of the first etchant.

Schutt, Chung, and Kanda do not teach using the total reaction energy as a reference. Schutt, Chung, and Kanda do not teach a controller that controls the first tank, the etch bath and the second tank. Schutt, Chung, and Kanda do not teach using gravity (i.e. weight) for separating the diluted etchant from the residual material.

Allies teaches a controller (340; Figure 3; column 3, lines 55-60) that controls the volume of fluid within numerous process tanks (column 3, lines 58-67), including controlling the temperature of said tank(s) (column 3, lines 58-67) resulting from numerous input signals

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(column 4, lines 1-10). Allies further teaches teach using gravity (i.e. weight) for separating the etchant (CuCl_2 etchant – column 3, lines 37-40) from residual material by mass/material filtration in filtration tank 338, Figure 3 – column 5, line 64 - column 6, line 5

At the time of the invention it would have been obvious to a person of ordinary skill in the art to control the etching operation for the etching apparatus of Schutt with the chemical processing control system of Kanda and Allies including using the total reaction energy as a reference by replacing Kanda's temperature in any of Kanda's "Q" equations (column 10) with "reaction energy" as derived from the well know thermodynamic relationship between molar enthalpy (per unit mass), heat capacity, and temperature¹:

$$\frac{\partial H}{\partial T} \equiv c_p$$

The motivation for controlling the etching operation for the etching apparatus of Schutt and Chung et al with the chemical processing control system of Kanda and Allies, using "reaction energy", would have been to detect the termination of etching appropriately and precisely as taught by Kanda (column 10, lines 44-47) by an alternate a equivalent means of detecting said termination in using "reaction energy".

At the time of the invention it would have been obvious to a person of ordinary skill in the art to add Allies's mass/material separation filtration tank to Schutt's processing system.

The motivation to add Allies's mass/material separation filtration tank to Schutt's processing system is to further purifying the recycled spent etchant solution as taught by Allies (column 5, line 64 - column 6, line 5).

¹ As demonstrated (MPEP 2116.01) in Physics for Scientists & Engineers, 2nd Ed. R.A. Serway, Saunders College Publishing, 1986. pp. 428 (see top-most equation).

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Therefore, it would have been obvious to a person of ordinary skill in the art to combine Schutt with Chung et al and Kanda to obtain the invention.

3. Claims 3-6, 8, 9, 12, 15, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schutt (US 3,532,568 A) in view of Chung et al (U.S.Pat.5,00,795), Kanda (U.S. Pat. No. 4,886,590), and Allies, Victoria R. et al (U.S.Pat. 5,560,838), and further in view of Jones et al (U.S. Pat. No. 3,869,313).

Schutt, Chung, Kanda, and Allies are discussed above.

Schutt, Chung, Kanda, and Allies do not disclose expressly a rinse and drying bath for the substrate.

As to claims 3-5, 8, 9, and 12, Jones et al disclose a chemical processing apparatus containing a plurality of treatment chambers having a dip chamber with filling pumps, a spray chamber which serves as a rinse chamber or a drying chamber (col. 2, lines 20-39 and 63-68; col. 3, lines 1-10). The rinse chamber would be filled with deionized water from a deionized reservoir (col. 2, lines 52-55). An essential part of the apparatus is a conveyor means for automatically transferring the workpieces from treatment chamber to treatment chamber. (Fig. 1; Col. 3, lines 50-55). The conveyor allows for a plurality of substrates to be processed substantially at the same time. Using a pump to move fluid from one chamber to another is conventional. Jones further teaches a controlled heater 67" (column 2, lines 28-35) used in the treatment chamber that may be used as a drying chamber (column 3, lines 1-3).

As to claim 6, Jones et al disclose a cleaning/etching solution containing hydrofluoric acid (col. 5, lines 49-60; col. 6, lines 33-35 and 51-54). Jones et al disclose cone shaped bottom tanks (Figs. 6A-B).

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At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the multiple chambers for rinsing and drying of Jones et al with the etching apparatus of Schutt, Chung et al, and Kanda.

The motivation for doing so would have been to provide treating operations such as rinsing and drying of substrates as taught by Jones et al.

4. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schutt (US 3,532,568 A) in view of Chung et al (U. S. Pat. No. 5,000,795), Kanda (U.S.Pat. 4,338,157), and Allies, Victoria R. et al (U.S.Pat. 5,560,838), and further in view of Tittle (USPat. 4,886,590). Schutt, Chung, Kanda, and Allies are discussed above. However, Schutt, Chung, Kanda, and Allies do not teach a concentration measuring device of the first etchant.

Tittle teaches a concentration ("characteristic"; column 1, lines 31-36; column 2, lines 17-22) measuring device ("sensors", "chromatograph"; column 1, lines 65-68).

It would have been obvious to one of ordinary skill in the art at the time the invention was made for Schutt, Chung, Kanda, and Allies to add a concentration measuring device as taught by Tittle to his endpoint detection system.

Motivation for Schutt, Chung, Kanda, and Allies to add a concentration measuring device as taught by Tittle to his process control system is for monitoring when the rinsing solution should be changed or cleaned (column 1, lines 39-41).

Response to Arguments

5. Applicant's arguments filed September 25, 2006 have been fully considered but they are not persuasive.

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6. Applicant states that his prior arguments under a now un-applied reference to Nelson remain effective and applicable. The Examiner disagrees. In particular, the “appearance” of the Examiner’s rejection remains consistent from the final action because, for example, the claimed invention has not changed significantly or at all. As a result, Applicant’s prior arguments based the now un-applied reference to Nelson are moot.

7. Applicant further states:

“

So Schutt does not teach a an etch bath that etches a glass substrate to uniformly reduce the thickness of the glass substrate. Rather, Schutt is directed to etching copper from off of a substrate, specifically a printed circuit board. Such a process is typically intended to form conductive patterns on the printed circuit board. Hence, etching a material uniformly to reduce its thickness is completely counter to the goal of Schutt.

“

and..

“

Schutt is actually silent as to the specifics of the etching zone, because Schutt is actually directed to an etching solution having a ferrous ion for etching copper.

“

and..

“

First, as discussed above with respect to claim 1, the Examiner fails to provide proper motivation of modify the system of Schutt to include an etch bath.

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“

In response, the Examiner notes that, universally, all of Applicant's claims are directed to an apparatus. As a result, any claim recitations such as “etch bath”, and “etches a glass substrate” are not structural recitation of the claimed apparatus and amount to an intended use in the pending apparatus claims. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim (Walter , 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (In re Casey, 152 USPQ 235 (CCPA 1967); In re Otto , 136 USPQ 458, 459 (CCPA 1963); MPEP 2111.02).

Applicant states:

“

Further, Chung is directed to a semiconductor wafer clean method and apparatus.

“

and..

“

Further, Schutt is directed to etching copper and more specifically an etching solution to etch copper, and Chung is directed to cleaning semiconductor wafers. These two are directed to completely different problems and fields. Therefore, absent proper motivation to modify the system of Schutt, the rejection of claims 1, 2, 7, 10, 11, 13, 14, 17-22, 25 and 26 is improper.

“

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8. In response to applicant's argument that Chung and Schutt are nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Chung is in the field of applicant's endeavor – wafer processing.

Applicant states:

“

Furthermore, the Examiner asserts that the bubble plate is an alternative and equivalent etching means to the etchant delivery means, however, the Examiner fails to address the fact the bubble plate requires a gas supply which is not disclosed in Schutt.

“

9. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

10. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

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In this case, motivation for adding Chung's etch bath is known to be an alternative and equivalent means to provide agitation of the solution as taught by Chung (column 2, lines 1-5).

11. Applicant states:

“

Furthermore, nowhere in Schutt is there any suggestion of the desirability of controlling the etching process based on the temperature of the etchant, because Schutt is directed to an etching solution.

“

12. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). It is noted above, with proper motivation, that Kanda et al disclose a process control system.

13. Applicant states that Kando does not teach a termination temperature. The Examiner disagrees. Specifically, Kanda indeed discloses “termination signal (P _ 0)” as detailed above.

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1763 art unit is (571) 273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435.

Ref Zervigon
12/11/6